NON-PUBLIC?: N
ACCESSION #: 9009060070
LICENSEE EVENT REPORT (LER)

FACILITY NAME: South Texas, Unit 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000498

TITLE: Manual Reactor Trip Due to Full Closure of a Feedwater Isolation Valve During Partial Stroke Testing
EVENT DATE: 07/30/90 LER #: 90-006-00 REPORT DATE: 08/31/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Scott M. Head - Supervising Licensing Engineer TELEPHONE: (512) 972-7136

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On July 30, 1990, Unit 1 was in Mode 1 at 100% power. At approximately 1946, Feedwater Isolation Valve 1A fully closed during a partial stroke surveillance test. The resultant loss of feedwater flow caused a decrease in steam generator level and the reactor was manually tripped. The unit was stabilized with the exception of level in Steam Generator 1A which did not recover due to a mispositioned recirculation test valve in the Train A Auxiliary Feedwater System (AFW). The recirculation test valve was returned to the required position and Steam Generator 1A level was recovered. The Feedwater Isolation Valve closure was caused by a technician inadvertently contacting the wrong terminal with a test jumper. The cause of the mispositioned recirculation test valve could not be conclusively established; however, it is likely that the valve was not correctly repositioned during a surveillance test prior to the event, and this error was not discovered due to a lack of adequate independent

verification. Corrective actions include: issuance of training bulletins concerning use of jumpers; evaluation of alternative designs to obviate the need to perform the partial stroke test with jumpers; and, issuance of a memorandum to operations personnel to reenforce the requirements pertaining to independent verification.

A1/LER006U1.L01

END OF ABSTRACT

DESCRIPTION OF EVENT:

On July 30, 1990, Unit 1 was in Mode 1 at 100% power. At 1946, Feedwater Isolation Valve (FWIV) 1A fully closed during performance of a partial stroke surveillance test. Steam Generator (SG) 1A level began decreasing and the reactor was manually tripped since an automatic reactor trip was imminent due to low steam generator water level. The turbine tripped, Feedwater Isolation occurred on low Reactor Coolant System average temperature, and Auxiliary Feedwater (AFV) flow initiated on low-low-steam generator level as expected. No other Engineered Safety Feature actuations occurred during this event. Emergency Operating Procedures were entered and the plant was stabilized with the exception that level did not recover in Steam Generator 1A as expected. Operations personnel determined that a recirculation valve on the "A" train of AFW was mispositioned causing the flow to return to the Auxiliary Feedwater Storage Tank (AFWST). The recirculation valve was repositioned to recover SG 1A level. The NRC was notified of this event at 2135 hours.

The FWIV's are hydraulically operated with a nitrogen charge in the upper cylinder. The valve is closed by opening one or both of two solenoid valves in parallel which dumps hydraulic fluid back to a reservoir; this allows the nitrogen charge to drive the valve closed. The partial stroke test verifies that both solenoids open and the FWIV closes to the 90% position. Solenoid position is sensed by reed switches connected to the test circuitry. The solenoids and reed switches are located within the valve yoke and are difficult to maintain at power. If a reed switch is not functioning correctly, as is the case with FWIV 1A, an "alternate" partial stroke test procedure using jumpers is employed which allows testing each solenoid individually.

The "alternate" partial stroke test procedure specifies use of alligator clips to connect jumpers. Prior to the event, a technician had installed the jumpers in a relay cabinet as specified in the test procedure. However, prior to actually conducting the stroke test, the alligator clip

of a landed jumper slipped off and fell to the floor. In the process of relanding the jumper, contact was inadvertently made with an adjacent terminal, causing FWIV 1A to close.

During the post-trip recovery process, Operations personnel observed that Steam Generator 1A level continued to decrease even though the associated AFW flow was approximately 600 gpm. The "A" train AFW pump was secured after receiving a low discharge pressure alarm. Cross connect valves were opened in an attempt to feed Steam Generator 1A from a different AFW train; however, this proved unsuccessful. Subsequently, the "A" train recirculating test valve was discovered to be locked open instead of being in the required "locked closed" position. This condition diverted AFW flow back to the AFWST, thereby preventing AFW flow from entering Steam Generator 1A. The recirculation test valve was repositioned and AFW flow was established to Steam Generator 1A.

An investigation determined that the last known time the recirculation valve was manipulated was on July 26 during a monthly AFV inservice pump test. There is no record of any other activities that would have caused the valve to be operated between July 26 and the date of the event. There is also no evidence of maliciousness or tampering. However, it was determined that a less than adequate independent verification was performed on the part of the two operators assigned to manipulate the valve during the July 26 test. Independent verification is the act of checking a condition, such as valve position, separately from establishing the condition or component position. Contrary to this philosophy, it was determined that both operators were present at the valve at the time it was to be closed, thus violating the intent of independent verification. It has been concluded, therefore, that the valve was apparently not correctly positioned by one operator (possibly due to the orientation of the valve), and that this condition was not discovered by the second operator due to a lack of adequate independent verification.

CAUSE OF EVENT:

The direct cause of the manual reactor trip was a failed-closed feedwater isolation valve. The failed-closed feedwater isolation valve was caused by a technician inadvertently contacting the wrong terminal with a test jumper. A contributing factor was that the test procedure specified use of alligator clips, which are prone to fall off the terminals used during the test. Additional contributing factors are that the FWIV's solenoid

valve reed switches were not functioning, and the design is such that they are difficult to maintain at power. With the reed switches not functioning, a successful partial stroke test could not be performed without the use of jumpers.

The cause of the mispositioned AFW recirculation valve could not be conclusively established; however, it is likely that the valve was not correctly positioned by one operator and that this error was not discovered due to a lack of adequate independent verification on the part of a second operator.

ANALYSIS OF EVENT:

Reactor Protection System and Engineered Safety Features actuations are reportable pursuant to 10CFR50.73.(a
(2)(iv). All safety systems
responded as expected, with the exception of Auxiliary Feedwater System Train A. Steam Generator 1A level decreased significantly and remained low for approximately one hour because AFW flow was diverted back to the AFWST due to a locked-open recirculation test valve. A minimum wide range level of 31% was achieved at approximately 50 minutes after the trip. An adequate heat sink was maintained during the event by maintaining AFW flow to "B", "C", and "D" steam generators.

Technical Specification 3.7.1.2 requires at least four independent steam generator auxiliary feedwater pumps and associated flow paths to be operable in Modes 1, 2, and 3 including three motor-driven and one turbine-driven pumps. Under the worst case Design Basis Accident scenarios, including single failure, one train of AFW is adequate to cool the RCS even if the "A" train of AFW is out-of-service. In recognition of this fact, the Technical Specification allows an unlimited outage time for the "A" train of AFW with the stipulation that action be immediately initiated to return the "A" train to service. Upon discovering the cause of the inoperability of "A" train, action was immediately taken to return the train to service. Since the Design Basis Accident can be adequately mitigated with the "A" AFW train out-of-service, this particular event had minimal safety consequences.

If the mispositioned valve had occurred on one of the other AFW trains, the worst case scenario is a main steam line break or a feedwater line break that is assumed to remove the cooling capacity of the AFW train on the affected steam generator. For these events the following cases were

analyzed:

Train B Valve Mispositioned: For this scenario, the worst case situation would arise if the break were located in the "C" train. The AFW design is such that if the single failure is assumed to be in the "A" actuation train of the Solid State Protection System, then neither the "A" or "D" trains of AFW would be automatically actuated. However, one of the early steps in performance of the Emergency Operation Procedures is verification of AFW actuation. AFW flow would be manually initiated by control room personnel, thus providing cooling flow to the steam generators.

Train C Valve Mispositioned: This scenario is similar to the "B" train scenario described above.

Train D Valve Mispositioned: For this case, the "D" train is unavailable due to the valve being mispositioned. In addition, one train of AFW is assumed unavailable due to the break and one train of AFW is unavailable due to a single failure, i.e., a standby diesel generator failed to start under loss of alternating current. This would still leave one train of AFW available to provide cooling to the RCS.

Since it is possible to readily provide flow to at least one steam generator with a locked open recirculation valve on any AFW train, the safety consequences of a locked open valve on any one AFW train are minimal.

The above cases have been analyzed in the Auxiliary Feedwater System Reliability Evaluation provided in Appendix 10A of the Updated Final Safety Analysis Report. Specifically, this reliability study included the assumption that a recirculation valve would be mispositioned with a frequency of 1 in 200 manipulations. STP experience is consistent with this assumption.

CORRECTIVE ACTION:

The following corrective actions are being taken as a result of this event:

1) A training bulletin will be issued by September 12, 1990 to I&C Technicians which will discuss this event and reemphasize

individual responsibilities in regard to critical testing manipulations.

2) The partial stroke surveillance test procedures as well as other surveillance procedures that use jumpers will be reviewed to develop enhancements that can minimize the potential for reactor trips or Engineered Safety Features actuations. This review will be completed by December 7, 1990.

3) An evaluation will be performed to determine if an alternative design can be developed which would allow for partial stroke testing of the FWIVs without the use of jumpers. This evaluation will be completed by January 31, 1991.

4) Valve lineups were performed immediately and independently verified on various valves in the major flow paths in the following safety-related systems for both Unit 1 and Unit 2: Auxiliary Feedwater, Containment Isolation, Main Feedwater, Containment Spray, and Safety Injection. Valve lineups were also performed on accessible Engineered Safety Feature valves in the Locked Valve Program and Standby Readiness Lineups were performed on the Standby Diesel Generators on both Unit 1 and Unit 2. No deficiencies were identified during these lineup checks.

5) The operators involved in the AFW valve manipulation were counseled as to the appropriate methods for performing independent verification.

6) A memorandum has been forwarded to the operating staff reemphasizing the need to "self verify" all manipulations to ensure that the desired result has in fact occurred.

7) A memorandum has been forwarded to the operating staff reemphasizing the importance of and requirements for independent verification and the proper methods of verifying valve positions.

8) This event will be included in operator continuing training, with emphasis placed on the ramifications of misaligning the Auxiliary Feedwater System and the requirements for Independent Verification. This action will be completed by November 30, 1990.

A1/LER006U1.L01

ADDITIONAL INFORMATION:

There has been a previously reported event (LER 2-89-019) concerning a reactor trip caused by a FWIV failing closed; however, the event was not associated with a test jumper but was caused by a failure in the test circuitry.

A1/LER006U1.L01

The Light
Company South Texas Project Electric Generating Station
Houston Lighting & Power P. O. Box 289 Wadsworth, Texas 77483

August 31, 1990
ST-HL-AE-3547
File No.: G26
10CFR50.73

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project Electric Generating Station
Unit 1
Docket No. STN 50-498
Licensee Event Report 90-006 Regarding
a Manual Reactor Trip Due to Full Closure of a
Feedwater Isolation Valve During Partial Stroke Testing

Pursuant to 10CFR50.73, Houston Lighting & Power Company (HL&P) submits the attached Licensee Event Report (LER 90-006) regarding a manual reactor trip due to full closure of a feedwater isolation valve during partial stroke testing. This event did not have any adverse impact on the health and safety of the public.

If you should have any questions on this matter, please contact Mr. S. M. Head at (512) 972-7136 or myself at (512) 972-7921.

Warren H. Kinsey, Jr.
Vice President
Nuclear Generation

SMH/amp

Attachment: LER 90-006 (South Texas, Unit 1)

A1/LER00U1.L01
A Subsidiary of Houston Industries Incorporated

cc:

Regional Administrator, Region IV Rufus S. Scott
Nuclear Regulatory Commission Associate General Counsel
611 Ryan Plaza Drive, Suite 1000 Houston Lighting & Power Company
Arlington, TX 76011 P. O. Box 61867
Houston, TX 77208
George Dick, Project Manager
U. S. Nuclear Regulatory Commission INPO
Washington, DC 20555 Records Center
1100 Circle 75 Parkway
J. I. Tapia Atlanta, GA 30339-3064
Senior Resident Inspector
c/o U. S. Nuclear Regulatory Dr. Joseph M. Hendrie
Commission 50 Bellport Lane
P. O. Box 910 Bellport, NY 11713
Bay City, TX 77414
D. K. Lacker
J. R. Newman, Esquire Bureau of Radiation Control
Newman & Holtzinger, P. C. Texas Department of Health
1615 L Street, N. W. 1100 West 49th Street
Washington, DC 20036
Austin, TX 78704

D. E. Ward/R. P. Verret
Central Power & Light Company
P. O. Box 2121
Corpus Christi, TX 78403

J. C. Lanier
Director of Generation
City of Austin Electric Utility
721 Barton Springs Road

Austin, TX 78704

R. J. Costello/M. T. Hardt
City Public Service Board
P. O. Box 1771
San Antonio, TX 78296

Revised 12/15/89

L4/NRC/

*** END OF DOCUMENT ***